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ATM Cable Interface Processor (ACIP) Installation and Configuration

Product Numbers: ACIP-SM(=)

This publication contains instructions for installing and performing a basic configuration of the Asynchronous Transfer Mode (ATM) Cable Interface Processor (ACIP). This publication contains basic configuration steps and examples.

Sections in this publication include the following:

1

ATM Terms and Acronyms

The following are common ATM terms and acronyms for your reference:

AAL—ATM Adaptation Layer. An AAL defines the conversion of user information into cells. AAL1 and AAL2 handle isochronous traffic, such as voice and video; AAL3/4 and AAL5 pertain to data communications through the segmentation and reassembly of packets.

ATM—Asynchronous transfer mode. A cell-switching and multiplexing technology combining the benefits of circuit switching (constant transmission delay, guaranteed capacity) with those of packet switching (flexibility, efficiency for intermittent traffic). ATM is defined by ITU-T standards.

Average-rate—The average rate, in kbps, at which a given virtual circuit (VC) will transmit data.

BISDN—Broadband Integrated Services Digital Network. A set of standards under development by the ITU-T for services based on ATM switching and SONET/SDH transmission.

CCITT—Consultative Committee for International Telegraph and Telephone (Although commonly referred to as the CCITT, this international standards body recently adopted the name *International Telecommunication Union/Telecommunication Standardization Sector* (ITU-T).

CLP—Cell loss priority.

DXI—Data exchange interface.

ILMI—Interim Local Management Interface. Described in the ATM Forum's UNI specification, ILMI allows end users to retrieve a basic set of information, such as status and configuration about virtual connections and addresses, for a particular UNI.

MIB—Management Information Base.

MIC—Media interface connector.

MID—Message identifier. In AAL3/4 encapsulation, the 2-byte MID field allows multiplexing of streams of cells on one virtual channel.

NSAP—Network Service Access Point.

OAM—Operation Administration and Maintenance (cells).

PDU—Protocol data unit. An OSI term for a packet.

Peak-rate—The maximum rate, in kbps, at which a given VC can transmit data.

PMD—Physical medium dependent. The lower half of BISDN Layer 1.

PLIM—Physical layer interface module. The PLIM contains the interface to the ATM cable. (See the section "ACIP Interface" on page 5.)

PVC—Permanent virtual circuit.

QOS—Quality of service.

Rate queues—Rate queues define the speed at which individual VCs will transmit data to the remote end. Every VC *must* be associated with one rate queue. After attachment to this rate queue, the VC is assumed to have its peak rate set to that of the rate queue. Each rate queue can be configured independently to a portion of the overall bandwidth available on the ATM link. The combined bandwidths of all rate queues should not exceed the total bandwidth available.

SAR—Segmentation and reassembly.

SDH—Synchronous Digital Hierarchy. International standard for optical digital transmission at hierarchical rates from 155 Mbps to 2.5 Gbps and greater.

SDU—Service data unit.

SONET—Synchronous Optical Network. An ATM UNI specification and American National Standards Institute (ANSI) standard (T1.105-1988) for optical digital transmission at hierarchical rates from 51.840 Mbps (STS-N) to 2.5 Gbps and greater.

SONET OC3—Optical Carrier-3 specification.

SSCOP—Service Specific Connection Oriented Protocol. SSCOP Resides in the service specific convergence sublayer of the ATM adaptation layer. SSCOP is used to transfer variable-length service data units between users of SSCOP, and provides for the recovery of lost or corrupted SDUs.

SSCS—Service specific convergence sublayer.

SVC—Switched virtual circuit.

UNI—User-to-Network Interface. An ATM interface defined by the ATM Forum for public and private ATM network access.

VC—Virtual circuit. Point-to-point connections to remote hosts/routers. Each ATM VC has the following characteristics associated with the VC: peak rate, average rate, cell quota, quality of service (QOS), AAL mode (AAL3/4 or AAL5), encapsulation type (LLC/SNAP, NLPID, SMDS, MUX, QSAAL). The VC characteristics are defined when the VC is created.

VCD—Virtual circuit descriptor.

VPI/VCI—Virtual path identifier/virtual channel identifier. ATM virtual connection information. A virtual path is a generic term for a bundle of virtual channels that have the same end point.

Asynchronous Transfer Mode Overview

Asynchronous Transfer Mode (ATM) uses cell-switching and multiplexing technology that combines the benefits of circuit switching (constant transmission delay and guaranteed capacity) with those of packet switching (flexibility and efficiency for intermittent traffic). ATM is a connection-oriented environment. All traffic to or from an ATM network is prefaced with a virtual path identifier (VPI) and virtual channel identifier (VCI). A VPI/VCI pair is considered a single virtual circuit (VC). Each VC is a private connection to another node on the ATM network. Each VC is treated as a point-to-point mechanism to another router or host and is capable of supporting bidirectional traffic.

Each ATM node is required to establish a separate connection to every other node in the ATM network that it must communicate with. All such connections are established using a PVC or an SVC with an ATM signaling mechanism. This signaling is based on the ATM Forum UNI Specification V3.0.

Note   The ACIP uses PVC connections with AAL5. There is one PVC for each active subscriber modem. PVCs are created automatically; there is no need for user intervention.

Each VC is considered a complete and separate link to a destination node. Users can encapsulate data as they see fit across the connection. The ATM network disregards the contents of the data. The only requirement is that data be sent to the ACIP card in the specific ATM adaptation layer (AAL) format.

An AAL defines the conversion of user information into cells. The AAL segments upper-layer information into cells at the transmitter and reassembles them at the receiver. AAL3/4 and AAL5 support data communications. AAL3/4 is supported as of Cisco IOS Release 10.2 and later.

An ATM connection transfers raw bits of information to a destination router/host. The ATM router takes the common part convergence sublayer (CPCS) frame, carves it up into 53-byte cells, and sends these cells to the destination router or host for reassembly. Forty-eight bytes of each cell are used for the CPCS data; the remaining 5 bytes are used for cell routing. The 5-byte cell header contains the destination VPI/VCI, payload type, cell loss priority (CLP), and header error control.

Unlike a LAN, which is connectionless, ATM requires certain features to provide a LAN environment to the users. One such feature is broadcast capability. Protocols wanting to broadcast packets to all stations in a subnet must be allowed to do so with a single call to Layer 2. In order to support broadcasting, the router allows the user to specify a particular VC as a broadcast VC. When the protocol passes a packet with a broadcast address to the ATM driver, the packet is duplicated and sent to each VC marked as a broadcast VC. This method is known as pseudobroadcasting.

ACIP Description

The ATM Cable Interface Processor (ACIP) (see Figure 1) provides a single ATM network interface for a Cisco 7500 series router by providing a direct connection between the router's high-speed Cisco Extended Bus (CyBus) and external equipment. The ACIP can be connected directly to a TeraLink 1000 cable headend, or through a Cisco Lightstream 1010 ATM switch or other external ATM network equipment. The physical layer interface module (PLIM) on the ACIP provides a SONET/SDH (STS-3C) interface connection.

Figure 1   ACIP with the UNI 155-Mbps Interface
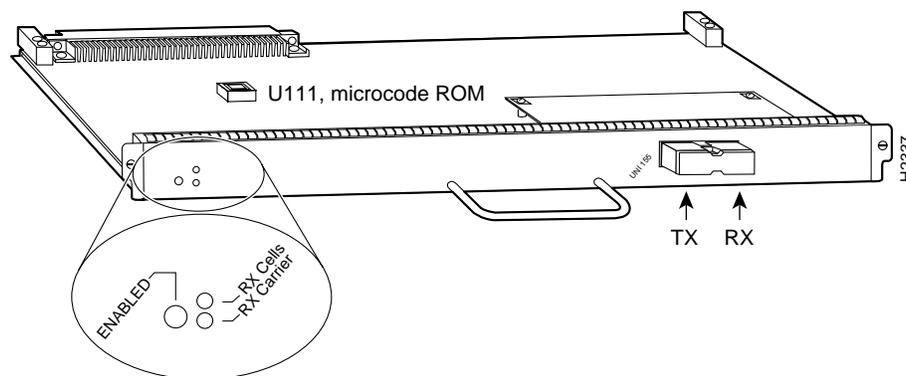
ACIP Features

The ACIP supports the following features:

- Multiple rate queues.

- Reassembly of up to 512 buffers simultaneously. Each buffer represents a packet.

- Up to 2,048 virtual circuits.

- Transfer rates per VPI limited to fixed values provided by the cable headend.

- Exception queue, which is used for event reporting. Events such as CRC errors are reported to the exception queue.

- Raw queue, which is used for all raw traffic over the ATM network. Raw traffic includes Operation Administration and Maintenance (OAM) cells and Interim Local Management Interface (ILMI) cells. (ATM signaling cells are not considered raw.)

ACIP Interface

The ACIP's ATM interface is full duplex. You must use the appropriate ATM interface cable to connect the ACIP with external ATM equipment. (Refer to the section "ACIP Cables, PLIM, and Connections," on page 7, for descriptions of ATM cables and connectors.) The ACIP provides an interface to ATM switching fabrics for transmitting and receiving data at rates of up to 155 Mbps bidirectionally; the actual rate is determined by the PLIM. The ACIP supports a PLIM that connects to the following physical layer: SONET/SDH 155 Mbps, multimode fiber optic—STS-3C (or STM-1).

SONET Distance Limitations

The SONET specification for fiber-optic transmission defines two types of fiber: single mode and multimode; however, the ACIP supports multimode fiber only. Modes can be thought of as bundles of light rays entering the fiber at a particular angle. Multimode fiber allows multiple modes of light to propagate through the fiber. Because multiple modes of light propagating through the fiber travel different distances depending on the entry angles, causing them to arrive at the destination at different times (a phenomenon called modal dispersion), single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber.

The typical maximum distances for multimode transmissions, as defined by SONET, are in Table 1. If the distance between two connected stations is greater than these maximum distances, significant signal loss can result, making transmission unreliable.

Table 1   SONET Maximum Fiber-Optic Transmission Distances

Transceiver Type	Maximum Distance between Stations[1]
Multimode	Up to 1.5 miles (3 kilometers)

1. Table 1 gives typical results. You should use the power budget calculations to determine the actual distances.

Power Budget

To design an efficient optical data link, evaluate the power budget. The power budget is the amount of light available to overcome attenuation in the optical link and to exceed the minimum power that the receiver requires to operate within its specifications. Proper operation of an optical data link depends on modulated light reaching the receiver with enough power to be correctly demodulated.

Attenuation, caused by the passive media components (cables, cable splices, and connectors), is common to both multimode and single-mode transmission.

The following variables reduce the power of the signal (light) transmitted to the receiver in multimode transmission:

- Chromatic dispersion (spreading of the signal in time because of the different speeds of light wavelengths)

- Modal dispersion (spreading of the signal in time because of the different propagation modes in the fiber)

Attenuation is significantly lower for optical fiber than for other media. For multimode transmission, chromatic and modal dispersion reduce the available power of the system by the combined dispersion penalty (dB). The power lost over the data link is the sum of the component, dispersion, and modal losses.

Table 2 lists the factors of attenuation and dispersion limit for typical fiber-optic cable.

Table 2   Typical Fiber-Optic Link Attenuation and Dispersion Limits

Limits	Multimode
Attenuation	1.0 dB/km
Dispersion	500 MHzkm[1]

1. The product of bandwidth and distance must be less than 500 MHzkm.

Approximating the ACIP Power Margin

The LED used for a multimode transmission light source creates multiple propagation paths of light, each with a different path length and time requirement to cross the optical fiber, causing signal dispersion (smear). Higher order mode loss (HOL) results from light from the LED entering the fiber and being radiated into the fiber cladding. A worst case estimate of power margin (PM) for multimode transmissions assumes minimum transmitter power (PT), maximum link loss (LL), and minimum receiver sensitivity (PR). The worst case analysis provides a margin of error, although not all of the parts of an actual system will operate at the worst case levels.

The power budget (PB) is the maximum possible amount of power transmitted. The following equation lists the calculation of the power budget:

$$PB = PT - PR$$

$$PB = -18.5 \text{ dBm} - (-30 \text{ dBm})$$

$$PB = 11.5 \text{ dB}$$

The power margin calculation is derived from the power budget minus the link loss, as follows:

$$PM = PB - LL$$

If the power margin is positive, as a rule, the link will work.

Table 3 lists the factors that contribute to link loss and the estimate of the link loss value attributable to those factors.

Table 3   Estimating Link Loss

Link Loss Factor	Estimate of Link Loss Value
Higher order mode losses	0.5 dB
Clock recovery module	1 dB
Modal and chromatic dispersion	Dependent on fiber and wavelength used
Connector	0.5 dB
Splice	0.5 dB
Fiber attenuation	1 dB/km

After calculating the power budget minus the data link loss, the result should be greater than zero. Results less than zero may have insufficient power to operate the receiver.

For the ACIP, the signal must meet the worst case parameters listed in Table 4.

Table 4   ACIP SONET Signal Requirements

Parameter	Multimode
PT	–15
PR	–28
PB	–13

Multimode Power Budget Example with Sufficient Power for Transmission

The following is an example multimode power budget calculated based on the following variables:

- Length of multimode link = 3 kilometers (km)
- 4 connectors
- 3 splices
- Higher order loss (HOL)
- Clock recovery module (CRM)

Estimate the power budget as follows:

PB = 11.5 dB – 3 km (1.0 dB/km) – 4 (0.5 dB) – 3 (0.5 dB) – 0.5 dB (HOL) – 1 dB (CRM)

PB = 11.5 dB – 3 dB – 2 dB – 1.5 dB – 0.5 dB – 1 dB

PB = 3.5 dB

The value of 3.5 dB indicates that this link would have sufficient power for transmission.

Multimode Power Budget Example of Dispersion Limit

Following is an example with the same parameters as the previous example, but with a multimode link distance of 4 km:

PB = 11.5 dB – 4 km (1.0 dB/km) – 4 (0.5 dB) – 3 (0.5 dB) – 0.5 dB (HOL) – 1 dB (CRM)

PB = 11.5 dB – 4 dB – 2 dB – 1.5 dB – 0.5 dB – 1 dB

PB = 2.5 dB

The value of 2.5 dB indicates that this link would have sufficient power for transmission. But, because the dispersion limit on the link (4 km x 155.52 MHz > 500 MHzkm), this link would not work with multimode fiber. In this case, single-mode fiber would be the better choice.

ACIP Cables, PLIM, and Connections

An ACIP interface cable is used to connect your router to an ATM network. For SONET/SDH (STS-3C) multimode connections, use one multimode duplex SC-type connector (see Figure 2) or two single SC-type connectors. (See Figure 3.)
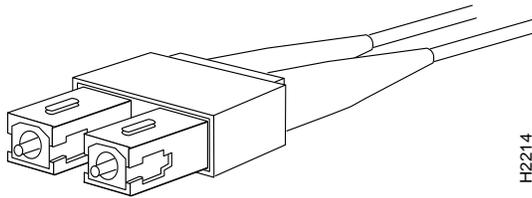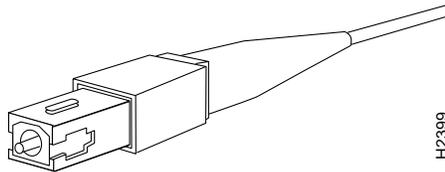
Figure 2   Duplex SC-Type Connector

H2214

Figure 3   Simplex SC-Type Connector
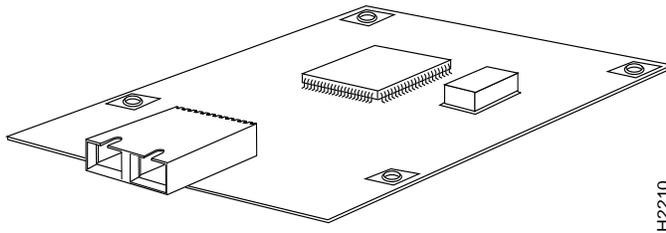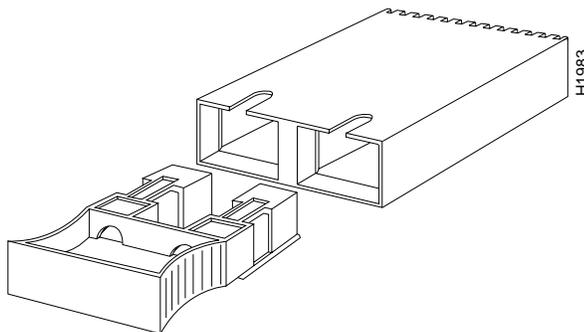

H2399

The multimode cable connects to the SC connector on the PLIM. (See Figure 4.)

Figure 4   SONET Multimode SC Duplex PLIM

H2210

The SONET multimode SC-type duplex connector is shipped with a dust plug. (See Figure 5.) Remove the plug by pulling on the plug as you squeeze its sides.

Figure 5   SONET ATM Multimode Fiber-Optic Transceiver and Dust Plug

H1983

ACIP Installation Prerequisites

Before you begin the ACIP installation, review the guidelines in this section to ensure a successful installation, to avoid injuring yourself, or to avoid damaging the equipment. This section also provides a list of parts and tools you will need to perform the installation.

ACIP Software Prerequisites

To ensure correct operation of the ACIP, Cisco IOS Release 11.2(7)P or later is required.

Hardware and Host Router Prerequisites

The following list describes specific hardware and host router prerequisites:

- Note that the ACIP is not supported in Cisco 7500 series routers with an RSP4 installed. Only RSP1s and RSP2s can be used with the ACIP.

- Note that the ACIP is not supported in the Cisco 7000 series routers: Cisco 7000 and Cisco 7010.

- You must use the ACIP in the following Cisco 7500 series routers:

    — Cisco 7505 (see Figure 6)

    — Cisco 7507 (see Figure 7)

    — Cisco 7513 (see Figure 8)

The Cisco 7500 series routers provide high reliability, availability, serviceability, and performance, and supports multiprotocol, multimedia routing, and bridging with a wide variety of protocols and any combination of available electrical interfaces and media. Network interfaces reside on modular interface processors (such as the ACIP), which provide a direct connection between the high-speed, 1.067-gigabits-per-second (Gbps) Cisco Extended Bus (CyBus) and external networks. The Cisco 7507 and Cisco 7513 each have two CyBuses for an aggregate bandwidth of 2.134 Gbps.

Figure 6 shows the rear of the 5-slot Cisco 7505 router. In the Cisco 7505, one slot (4) is reserved for the Route Switch Processor (RSP1), which contains the main system processor and performs packet switching functions. Slots 0 through 3 are for interface processors, including the ACIP. (There are no restrictions on slot locations or sequence; you can install an ACIP in any available interface processor slot.)

Figure 6   Cisco 7505, Interface Processor End
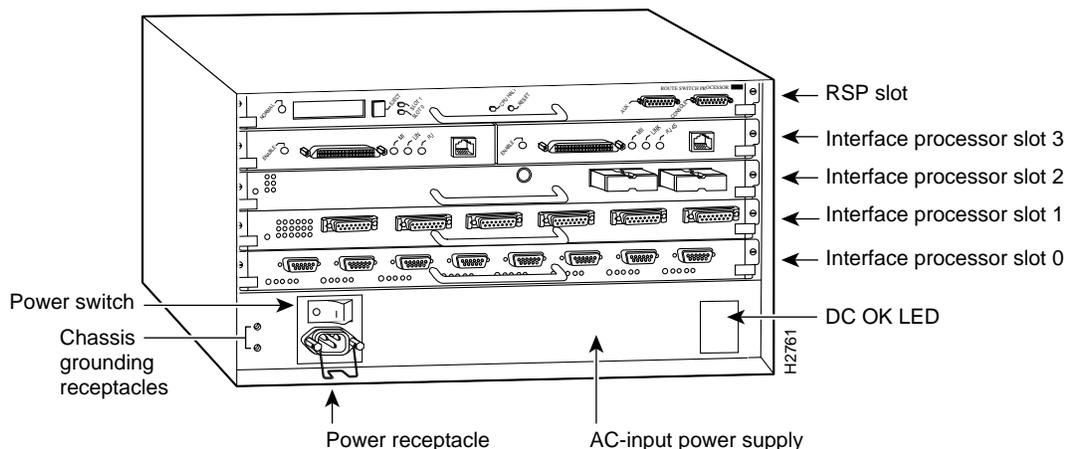
Figure 7 shows the rear of the 7-slot Cisco 7507 router. In the Cisco 7507, up to two slots (2 and 3) are reserved for the Route Switch Processor (RSP2), which contains the system processor and performs packet switching functions. Slots 0 and 1, and 4 through 6 are for interface processors, including the ACIP. (There are no restrictions on slot locations or sequence; you can install an ACIP in any available interface processor slot.)

Figure 7   Cisco 7507, Interface Processor End

Figure 8 shows the rear of the 13-slot Cisco 7513. In the Cisco 7513, up to two slots (6 and 7) are reserved for the Route Switch Processor (RSP2), which contains the system processor and performs packet switching functions. Slots 0 through 5, and 8 through 12 are for interface processors, including the ACIP. (There are no restrictions on slot locations or sequence; you can install an ACIP in any available interface processor slot.)

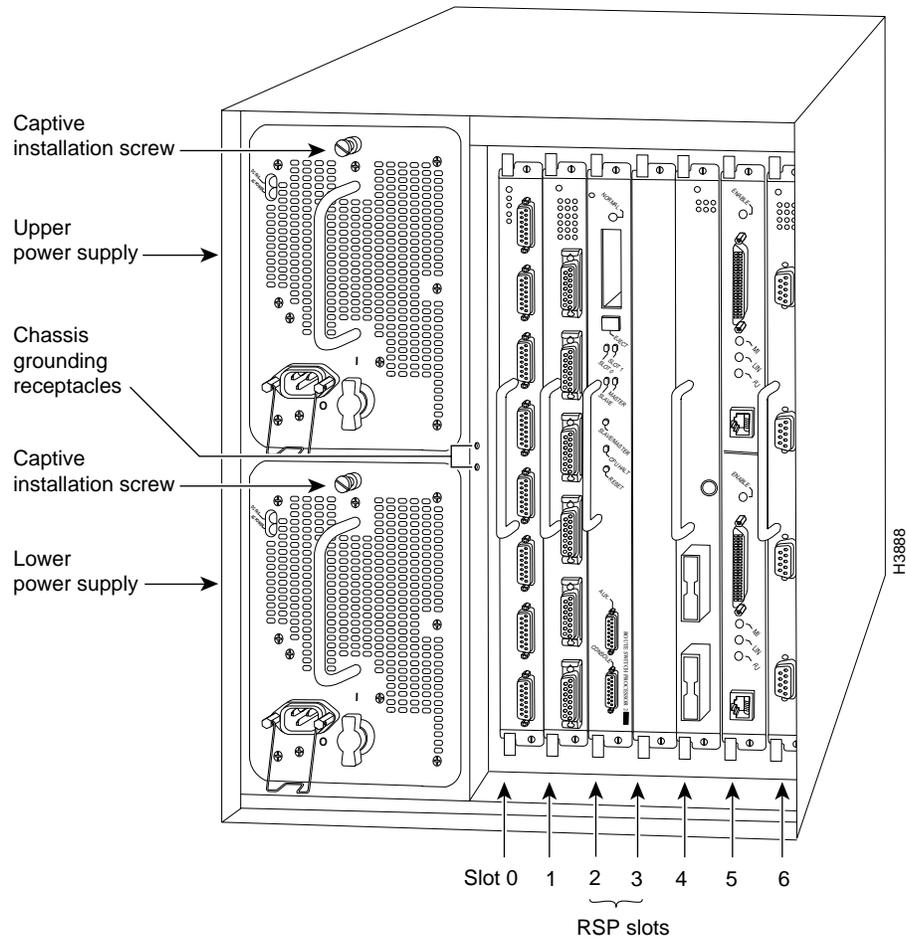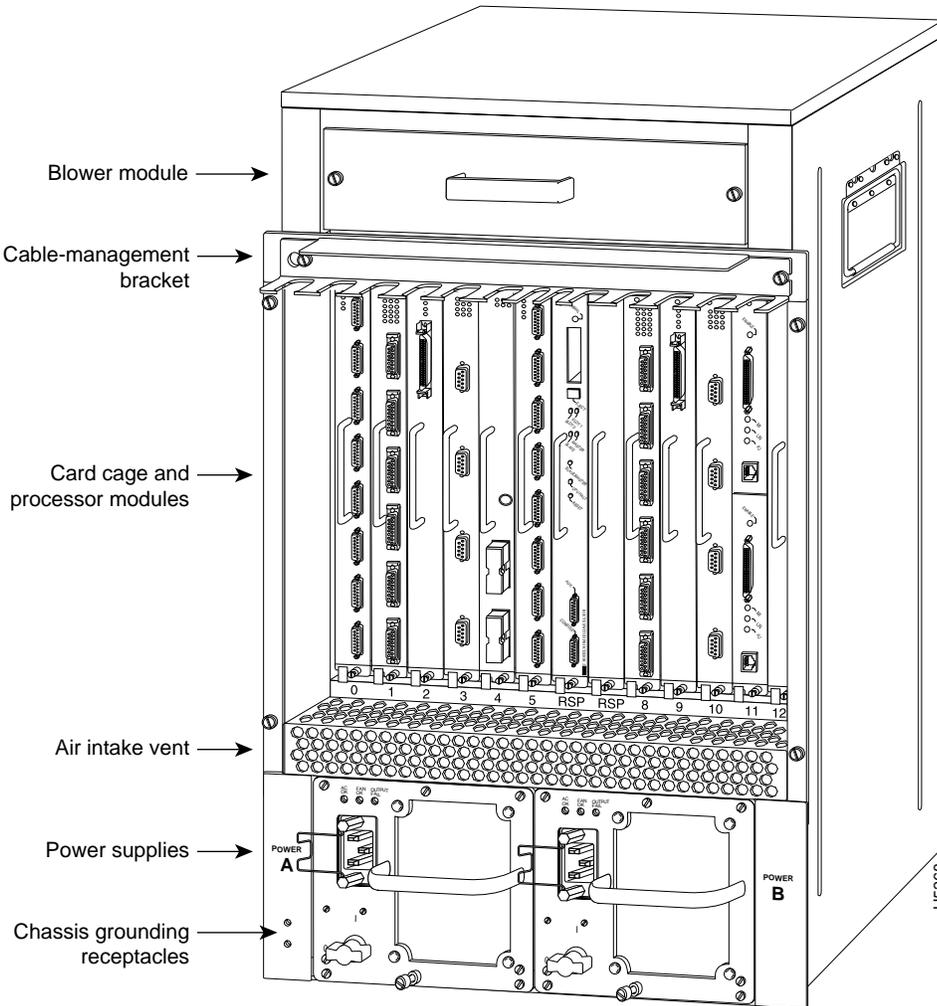**Figure 8   Cisco 7513, Interface Processor End**

List of Parts and Tools

You need the following tools and parts to install or upgrade an ACIP. If you need additional equipment, contact your service representative for ordering information.

- ACIP-SM(=) and an empty interface processor slot in your Cisco 7500 series router

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Note   The ACIP is not supported in Cisco 7500 series routers with an RSP4 installed. Only RSP1s and RSP2s can be used with the ACIP.

- The appropriate single-mode optical-fiber cable(s) with Simplex or Duplex connections (optical-fiber cables are not available from Cisco Systems; cables are available from commercial cable vendors)
- Number 2 Phillips screwdriver or a 3/16-inch flat-blade screwdriver
- Appropriate multimode optical-fiber cable (not available from Cisco Systems) to connect the ACIP with the ATM network
- ESD cord and wrist strap or disposable wrist strap that shipped with the ACIP

Safety Guidelines

This section lists safety guidelines to follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

Warning   Means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Waarschuwing   Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

Varoitus   Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.

¡Advertencia! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.

Varning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

Electrical Equipment

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.

- Disconnect all power and external cables before moving a chassis; do not work alone if potentially hazardous conditions exist.

- Never assume that power is disconnected from a circuit; always check.

- Do not perform any action that creates a potential hazard to people or makes equipment unsafe.

- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.

- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. An ACIP comprises a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, always use a preventive antistatic strap when handling an ACIP. Handle the carriers by the handles and the carrier edges only; never touch the boards or connector pins.

⚠ **Caution**   Always tighten the captive installation screws on an ACIP. (See Figure 1.) These screws prevent accidental removal, provide proper grounding for the system, and help ensure that the bus connectors are properly seated in the backplane.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that the strap makes good skin contact.

- Connect the equipment end of the strap to a captive installation screw on an installed power supply.

- When installing an ACIP, use the ejector levers to properly seat the bus connectors in the backplane, then tighten both (top and bottom) captive installation screws. (See Figure 1.) These screws prevent accidental removal, provide proper grounding for the system, and help to ensure that the bus connectors are seated in the backplane.

- When removing an ACIP, use the ejectors to release the bus connectors from the backplane. Hold the handle on the front of an ACIP with one hand and support the bottom edge of the metal carrier with the other hand. Pull the carrier out slowly, using your hand along the bottom of the carrier to guide an ACIP straight out of the slot.

- Handle carriers by the handles and carrier edges only; avoid touching the board or any connector pins.

- Place a removed ACIP board-side-up on an antistatic surface or in a static shielding bag. If the component will be returned to the factory, immediately place an ACIP in a static shielding bag.

- Avoid contact between an ACIP and clothing. The wrist strap only protects the board from ESD voltages on the body; ESD voltages on clothing can still cause damage.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

Installing and Removing an ACIP

An ACIP slides into slots in the rear of a Cisco 7500 series chassis and connects directly to the backplane. The backplane slots are keyed so that the ACIP can be installed only in the slots designated for it. (For interface processor slot locations, refer to section "Hardware and Host Router Prerequisites" on page 9.) Figure 9 shows the procedures for removing and installing an ACIP. When tightened, the captive installation screws on the ends of the ACIP faceplate help ensure proper seating in the backplane. After using the ejector levers to install an ACIP, immediately tighten the captive installation screws to prevent an ACIP from becoming partially dislodged from the backplane, and before installing additional processors; this will help reduce the effects of EMI.

⚠ **Caution** Failure to use ejector levers could result in a partial backplane connection, which can hang the system.

Figure 9   Installing and Removing an ACIP

Card carrier guide (black)

Captive installation screw
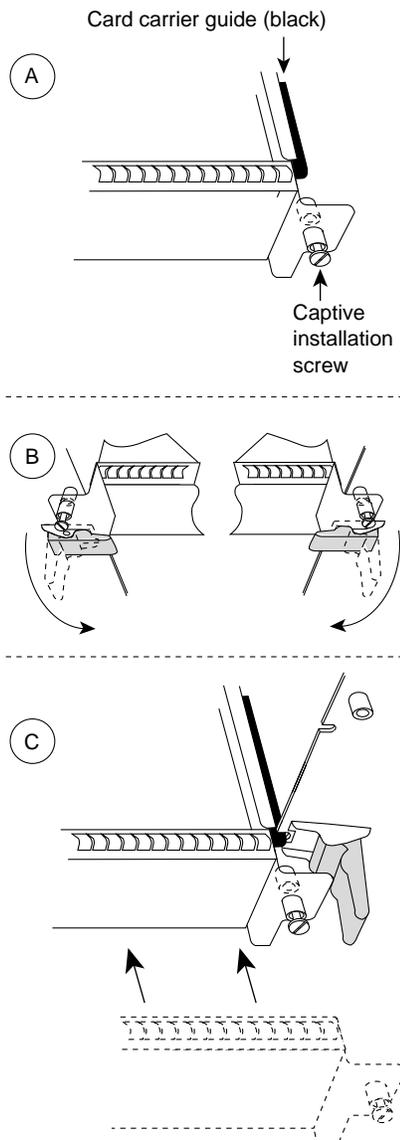
Remove a module as follows:

1. Use a screwdriver to loosen the captive installation screws (shown in A).

2. Simultaneously pull the ejector levers out to release the module from the backplane connector (shown in B). The levers should snap into their spring retainers.

3. Grasp the module handle with one hand and place your other hand under the carrier to support and guide the module as you pull it out of the slot. Avoid touching the card.

4. Place the removed module on an antistatic mat or antistatic foam, or immediately install it in another slot.

5. Install a new module or a filler (MAS7K-BLANK) to keep dust out of the chassis and to maintain proper airflow through the chassis.

Install a module as follows:

1. Choose a slot for the new module and ensure that there is enough clearance to accommodate any interface equipment that you will connect directly to its ports.

2. Use a screwdriver to loosen the captive installation screws (shown in A) and remove the filler (or the existing module) from the slot to be filled.

3. Hold the module handle with one hand, and place your other hand under the carrier to support the module and guide it into the slot. Avoid touching the card.

4. Place the back of the module in the slot and align the guide on the carrier with the groove in the slot (shown in A).

5. Carefully slide the module into the slot until the faceplate makes contact with the ejector levers (shown in C).

6. Use the thumb and forefinger of each hand to push the ejector lever flat against the module (shown in B).

7. Use a screwdriver to tighten the captive installation screws.
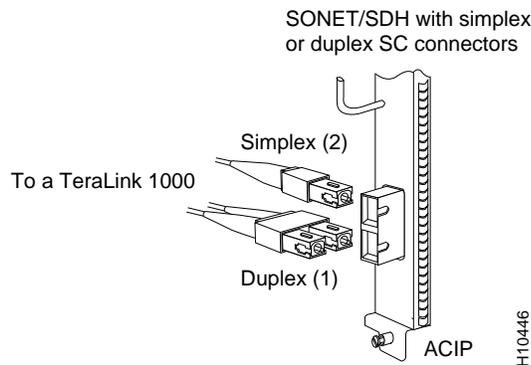
H2620

Attaching Network Interface Cables to the ACIP

The ACIP interfaces are full duplex. You must use the appropriate ATM interface cable to connect the ASIP to your TeraLink 1000, either directly, or through an external ATM network.

Connect cables to the ACIP as shown in Figure 10.

**Figure 10   Connecting Cables to the ACIP (Vertical Orientation Shown)**

Warning Invisible laser radiation may be emitted from the aperture ports of the single-mode products when no fiber cable is connected. *Avoid exposure and do not stare into open apertures*.

Using LEDs to Check ACIP Status

The ACIP has three status LEDs on its faceplate (see Figure 11).

Figure 11   ACIP LEDs (Partial Faceplate View, Horizontal Orientation)
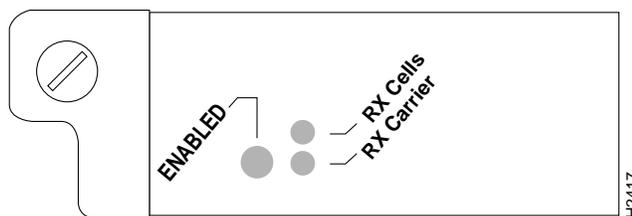
Following are the functions of the ACIP LEDs:

- Enabled—When on, indicates that the ACIP is enabled for operation; however, the interface ports might not be functional or enabled.

- RX cells —When on, indicates that the ACIP has received an ATM cell. This LED will flicker in normal operation, indicating traffic.

- RX carrier —When on, indicates that the ACIP has detected carrier on the RX cable. For a fiber-optic interface, this means simply that light is detected.

After you install the ACIP and attach the interface cable between the ACIP's interface port and your cable headend (TeraLink 1000) or external ATM switch, verify the installation by observing the LED states and the console display.

When the system has reinitialized all interfaces, the enabled LED on the ACIP should go on. The console screen will also display a message as the system discovers each interface during its reinitialization. After system initialization, the enabled LED, which is present on all interface processors, goes on to indicate that the ACIP is enabled for operation.

The following conditions must be met before the ACIP is enabled:

- The ACIP is correctly connected to the backplane and receiving power.

- The CyBus recognizes the ACIP card.

- A valid version of ACIP microcode is loaded and running.

If any of these conditions is not met, the enabled LED does not go on.

Verify that the ACIP is installed correctly as follows:

Step 1   While the system reinitializes each interface, observe the console display messages and verify that the system discovers the ACIP as follows:

- If you installed a new ACIP, the system should recognize the new ATM interface but leave the interface configured as *down*.

- If you replaced an ACIP, the system should recognize the interface and put the interface into the same state (*up* or *down*) the interface had when you removed it.

Step 2   When the reinitialization is complete, verify that the enabled LED on the ACIP is on and remains on. If the LED does stay on, proceed to step 5. If the enabled LED does not stay on, proceed to the next step.

Step 3   If the enabled LED on the ACIP fails to go on, suspect that the ACIP board connector is not fully seated in the backplane. Loosen the captive installation screws, then firmly push the top ejector down while pushing the bottom ejector up until both are at a 90-degree orientation to the ACIP faceplate. Tighten the captive installation screws. After the system reinitializes the interfaces, the enabled LED on the ACIP should go on. If the enabled LED goes on, proceed to step 5. If the enabled LED does not go on, proceed to the next step.

Step 4   If the enabled LED still fails to go on, remove the ACIP and try installing it in another available interface processor slot.

- If the enabled LED goes on when the ACIP is installed in the new slot, suspect a failed backplane port in the original interface processor slot.

- If the enabled LED still fails to go on, but other LEDs on the ACIP go on to indicate activity, proceed to step 5 to resume the installation checkout and suspect that the enabled LED on the ACIP has failed.

- If no LEDs on the ACIP go on, suspect that the ACIP is faulty.

- If the enabled LED still does not go on, do not proceed with the installation. Contact a customer service representative to report the faulty equipment and obtain further instructions.

Step 5   If the ATM interface is new, proceed to the section "Configuring the ACIP, " on page 21, to configure the new interface. (The interface is not available until you configure it.)

Step 6   If this installation was a replacement ACIP, use the **show interfaces** or **show controllers cbus** command to verify the status of the ATM interface. (For command descriptions and examples, refer to the section "Using show Commands to Verify Interface Status" on page 19.)

Step 7   When the interface is up, check the activity of the interface with the ACIP LEDs. (See Figure 11.)

If an error message displays on the console terminal, refer to the appropriate reference publication for error message definitions. If you experience other problems that you are unable to solve, contact a service representative for assistance.

This completes the procedure for checking initial ACIP status.

Using show Commands to Verify Interface Status

The **show version** command displays the current hardware configuration of the router, including the system software version that is currently loaded and running. The **show controller cbus** command lists all interfaces and includes the currently loaded and running microcode version for each. The **show diagbus** *slot* command shows the hardware and board revision of an interface processor in a designated interface processor slot.

Use the **show version** command to display the current system software version. In the following example of the **show version** command, the running system software is Release 11.2(7)P:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) RSP Software (RSP-ITV-M), Released Version 11.2(7)P [biff 265]
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Mon 24-Feb-97 17:20 by biff
Image text-base: 0x600108A0, data-base: 0x606D4000

ROM: System Bootstrap, Version 5.3(16645) [biff 571], RELEASE SOFTWARE
ROM: RSP Software (RSP-BOOT-M), Version 11.2(7)P, RELEASE SOFTWARE (fc1)

Router uptime is 1 day, 18 hours, 42 minutes
System restarted by reload
System image file is "biff/rsp-itv-mz", booted via tftp from 1.1.1.10

cisco RSP2 (R4600) processor with 32768K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
Chassis Interface.

(additional displayed text not shown)

1 ACIP controller (1 ATM).
1 ATM network interface(s)

(additional displayed text not shown)

125K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
No slave installed in slot 3.
Configuration register is 0x100
```

Following is an example of the **show controller cbus** display. Note the display of the ACIP's microcode version (20.2), PLIM type (SONET), and available bandwidth (155 Mbps).

```
Router# show cont cbus
MEMD at 40000000, 2097152 bytes (unused 2912, recarves 1, lost 0)
  RawQ 48000100, ReturnQ 48000108, EventQ 48000110
  BufhdrQ 48000120 (2961 items), LovltrQ 48000138 (2 items, 1632 bytes)
  IpcbufQ_classic 48000140 (8 items, 4096 bytes)
  3570 buffer headers (48002000 - 4800FF10)
  pool0: 12 buffers, 256 bytes, queue 48000128
  pool1: 244 buffers, 1536 bytes, queue 48000130
  pool2: 339 buffers, 4544 bytes, queue 48000148
  pool3: 4 buffers, 4576 bytes, queue 48000150

(additional displayed text not shown)

  slot5: ACIP, hw 1.3, sw 20.2, ccb 5800FF70, cmdq 480000A8, vps 8192
    software loaded from system
    ATM3/0, applique is SONET (155Mbps)
      gfreeq 48000148, lfreeq 480001C8 (4544 bytes), throttled 0
      rxlo 4, rxhi 339, rxcurr 0, maxrxcurr 2
      txq 480001D0, txacc 480000BA (value 226), txlimit 226
```

If the display indicates that the ACIP's microcode is an earlier version than 205.02, check the contents of Flash memory to determine if the required images are available on your system. (The **show flash** command displays a list of all files stored in Flash memory.)

Use the **show diagbus** *slot* command to determine if your ACIP is recognized by the system and to verify its hardware and board revision. Following is an example:

```
Router# show diagbus 3

Slot 3:
        Physical slot 3, ~physical slot 0x8, logical slot 3, CBus 0
        Microcode Status 0xB
        Master Enable, LED, WCS Loaded
        Board is analyzed
        EEPROM format version 1
        ATM Cable Interface Processor, HW rev 1.3, board revision B0
        Serial number: 03177260 Part number: 73-1188-03
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 08 81 03 00 30 7B 2C 49 04 A4 03 00 00 00 00
          0x30: 58 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x5DC (1d18h ago)
```

This completes the ACIP installation and installation checks. If you installed a new ACIP, you must now configure the new interface, as described in the following section.

Configuring the ACIP

Configuring the ACIP is a two step process: first you configure the ACIP, then you configure the cable headend and/or ATM switch. To configure ATM, complete the following tasks. The first two tasks are required, and then you must configure at least one PVC or SVC. The VC options you configure must match in three places: on the router, on the ATM switch, and at the remote end of the PVC or SVC connection.

- Enable the ACIP.

- Configure cable parameters.

- Monitor and maintain the ATM interface (optional).

Note   To configure your TeraLink 1000 cable headend and/or ATM switch, refer to the appropriate product's user documentation.

Perform the tasks in the following sections to configure the ACIP interface (all tasks are required except for the last task):

- Configure an ACIP Interface, page 22

- Configure Cable Parameters, page 23

- Configure the Integrated Routing and Bridging Feature, page 23

- Configure the Bridge-Group Virtual Interface, page 23

- Configure Protocols for Routing or Bridging, page 24

- Monitor and Maintain the ACIP, page 25

Note   After you configure the ACIP, you must configure the cable headend and/or ATM switch.

For information on additional commands that can be used with the ACIP, refer to the Cisco IOS Release 11.2(7)P feature guide. For an example ACIP configuration, refer to the section "Configuration Example" on page 25.

Configure an ACIP Interface

The ACIP interface (or subinterface) uses the configuration defaults shown in Table 1. For information on how to change the defaults, refer to the "Configuring ATM" chapter of the *Wide-Area Networking Configuration Guide* and the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*. All ATM and interface commands might not be applicable to the ACIP interface.

Note If a command is not available, the router displays the message "Command not supported on this interface."

Table 1   ACIP Defaults

Parameter	Command	Default Value
Maximum transmission unit	**mtu** *bytes*	4470
Exception queue buffers	**atm exception queue** *number*	32
Receive buffers	**atm rxbuff** *number*	256
Transmit buffers	**atm txbuff** *number*	256
Maximum number of virtual circuits (VCs)	**atm maxvc** *number*	2048
ATM raw cell queue size	**atm rawq-size** *number*	32
ATM VCs per VP	**atm vc-per-vp** *number*	1024
Source of Transmit Clock	**atm clock internal**	Recovered receive clock

To configure the ATM interface on the ACIP, perform the following tasks beginning in global configuration mode:

Task	Command
Step 1 Assign a bridge group.[1]	**bridge** *bridge-group* **protocol** {**dec**	**ieee**}
Step 2 Specify the interface and enter interface configuration mode.	**interface atm** *slot*/**0**[2]
Step 3 Assign the bridge group to the interface.	**bridge-group** *number*
Step 4 Disable the spanning tree on the interface.	**bridge-group** *number* **spanning-disabled**
Step 5 Change the shutdown state to up and enable the interface.	**no shutdown**

1. For more information on creating bridge groups, refer to the "Configuring Transparent Bridging" chapter of the *Bridging and IBM Network Configuration Guide*.
2. Because the ACIP contains a single interface, the port number is always 0.

Configure Cable Parameters

To assign the ATM interface on the ACIP to a cable headend and specify the cable headend IP address, perform the following tasks beginning in global configuration mode:

Task	Command
Step 1 Specify the ATM interface, VPI, and headend IP address.	**cable bind** *interface vpi ip-address*
Step 2 Optionally, enable proxy-ARP handling if user-to-user communication is permitted for each channel.	**cable enable-proxy** *interface vpi*

Note The Cisco IOS software automatically adds the **bridge** *number* **aging-time 604800** to the configuration file.

Configure the Integrated Routing and Bridging Feature

After you have set up the interfaces in the router, you can enable integrated routing and bridging.

To enable integrated routing and bridging, perform the following task in global configuration mode:

Task	Command
Enable integrated routing and bridging.	**bridge irb**

Use the **show interfaces irb** privileged EXEC command to display the protocols that a given bridged interface can route to the other routed interface when the packet is routable, and to display the protocols that a given bridged interface bridges.

Note For more information on the integrated routing and bridging feature, refer to the "Configuring Transparent Bridging" chapter of the *Bridging and IBM Network Configuration Guide.*

Configure the Bridge-Group Virtual Interface

The bridge-group virtual interface resides in the router. It acts like a normal routed interface that does not support bridging, but represents the entire corresponding bridge group to routed interfaces within the router. The bridge-group virtual interface is assigned the number of the bridge group that it represents. The bridge-group virtual interface number is the link between the bridge-group virtual interface and its bridge group. Because the bridge-group virtual interface is a virtual routed interface, it has all the network layer attributes, such as a network address and the ability to perform filtering. Only one bridge-group virtual interface is supported for each bridge group.

When you enable routing for a given protocol on the bridge-group virtual interface, packets coming from a routed interface but destined for a host in a bridged domain are routed to the bridge-group virtual interface, and are forwarded to the corresponding bridged interface. All traffic routed to the bridge-group virtual interface is forwarded to the corresponding bridge group as bridged traffic. All routable traffic received on a bridged interface is routed to other routed interfaces as if it is coming directly from the bridge-group virtual interface.

To create a bridge-group virtual interface, perform the following tasks in interface configuration mode:

Task		Command
Step 1	Enable a bridge-group virtual interface.	**interface bvi** *bridge-group*
Step 2	Specify the IP address for the interface.	**ip address** *ip-address mask*
Step 3	Disable the sending of redirect messages.	**no ip redirects**
Step 4	Optionally, enable fast-switching on the interface.	**ip route-cache same-interface**

Note   For more information on bridge-group virtual interfaces, refer to the "Configuring Transparent Bridging" chapter of the *Bridging and IBM Network Configuration Guide.*

Configure Protocols for Routing or Bridging

When integrated routing and bridging is enabled, the default route/bridge behavior in a bridge group is to bridge all packets.

You can then explicitly configure the bridge group to route a particular protocol, so that routable packets of this protocol are routed, while non-routable packets of this protocol or packets for protocols for which the bridge group is not explicitly configured to route will be bridged.

To configure specific protocols to be routed in a bridge group, perform the following task in global configuration mode:

Task	Command
Specify the IP protocol to be routed in a bridge group.	**bridge** *bridge-group* **route ip**

When you intend to bridge and route a given protocol in the same bridge group, you must configure the network-layer attributes of the protocol on the bridge-group virtual interface. Do not configure protocol attributes on the bridged interfaces. No bridging attributes can be configured on the bridge-group virtual interface.

Although it is generally the case that all bridged segments belonging to a bridge group are represented as a single segment or network to the routing protocol, there are situations where several individual networks coexist within the same bridged segment. To make it possible for the routed domain to learn about the other networks behind the bridge-group virtual interface, configure a secondary address on the bridge-group virtual interface to add the corresponding network to the routing process.

Note   For more information on the protocols to be routed in a bridge group, refer to the "Configuring Transparent Bridging" chapter of the *Bridging and IBM Network Configuration Guide.*

Monitor and Maintain the ACIP

After configuring the new interface, you can display its status. You can also display the current status of connections and active modems on each interface. To show current status information, perform the following tasks in EXEC mode:

Task	Command
Display the configured cable channels status.	**show cable channel**
Display the active modems.	**show cable modem**
Display the ATM interface status.	**show interface atm** *slot*/*number*
Display the BVI interface status.	**show interface bvi** *slot*/*number*

Configuration Example

This section contains an example that shows how to configure the ACIP interface; it also shows other Cisco IOS commands required for the ACIP to connect to a cable headend (modem).

Each ATM virtual circuit carries data for a single subscriber cable data modem. Data sent over this interface is first encapsulated in Ethernet frames and then encapsulated in AAL5 CPCS-PDU (per RFC 1483 LLC SNAP Encapsulation of Bridged Protocols). To support encapsulation, the router must operate as an integrated router/bridge by using the **bridge irb** command and the bridge-group virtual interface (**interface bvi** command). The bridge-group virtual interface decapsulates the Ethernet packets received from the ATM interface and multiplexes the router interface to multiple VCs. No actual bridging is performed between VCs.

All of the IP devices on each of the Ethernet interfaces of the subscriber cable data modem must be on the same IP subnet. The router, in general, will not perform an ARP to find MAC addresses of hosts; instead, the router will assume that DHCP is used by each host. Because entries in the ARP table must not age out normally, the software automatically adds the **bridge** *number* **aging-time 604800** command to the configuration file.

Data from one host to another on the same cable channel must be sent via the router. The router knows that two hosts are both on the same subnet and would normally send an ICMP redirect to inform the first host that a better path exists. However, because the cable media does not support direct host-to-host communications, the router must do the forwarding, and the ICMP must be suppressed with the **no ip redirects** command.

The **cable bind** command specifies the headend IP address (1.1.1.2), and the BVI interface specifies the local IP address (1.1.1.1).

```
Router(config)# interface atm 5/0
Router(config-if)# bridge-group 1
Router(config-if)# bridge-group 1 spanning-disable
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# cable bind atm 5/0 17 1.1.1.2
Router(config)# bridge irb
Router(config)# interface bvi 1
Router(config-if)# ip address 1.1.1.1 255.255.255.0
Router(config-if)# no ip redirects
Router(config-if)# exit
Router(config)# bridge 1 protocol dec
Router(config)# bridge 1 route ip
Router(config)# exit
```

ACIP Error Statistics

The ACIP maintains a count of certain errors. In addition to keeping a count of these errors, the ACIP also takes a snapshot of the last VCI/VPI that caused the error. Each ACIP error counter is 16 bits.

Errors include the following:

- CRC errors

- Giants received

- No buffers available

- Framing errors

- Applique/physical layer errors

- Packet timeout errors on receive

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces.

ATM show Commands

In addition to the **show** commands described in the section "Using show Commands to Verify Interface Status," on page 19, you can use the following additional **show** commands to display the current state of the ATM network and the connected VCs:

- To show current VCs and traffic information, use the **show atm vc [vcd]** command:

  Specifying a VCD will display specific information about that VCD.

- To show current ATM-specific information about an interface, use the **show atm int interface** command:

- To show current ATM traffic, use the **show atm traffic** command:

  This command displays global traffic information to and from all ATM networks connected to the router.

Following are descriptions and examples of the preceding **show** commands:

- Use the **show atm vc** command to display the following types of statistics for all VCs:

```
Router# show atm vc
                             AAL /         Peak   Avg.  Burst
Interface     VCD  VPI   VCI Type  Encapsulation  Kbps   Kbps Cells Status
ATM3/0.1        1   16    32  PVC   AAL5-SNAP      8192   8192  1024 ACTIVE
ATM3/0.1        2   16    33  PVC   AAL5-SNAP      8192   8192  1024 ACTIVE
```

- Use the **show atm vc** *n* command to display statistics for a given PVC, where *n* is the VCD. The following is sample output from the **show atm vc** *n* command, with VCD 1 specified:

```
Router# show atm vc 1
ATM3/0.1: VCD: 1, VPI: 16, VCI: 32, etype:0x0, AAL5 - LLC/SNAP, Flags: 0x130
PeakRate: 8192, Average Rate: 8192, Burst Cells: 1024, VCmode: 0xE200
OAM DISABLED, InARP DISABLED
InPkts: 0, OutPkts: 9, InBytes: 0, OutBytes: 630
InPRoc: 0, OutPRoc: 9, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
OAM F5 cells sent: 0, OAM cells received: 0
Status: ACTIVE
```

- Use the **show interfaces atm** *slot/port* command to display statistics for the ATM interface you specify by its slot/port address as follows:

```
Router# show atm int ATM3/0
ATM interface ATM3/0:
AAL enabled: AAL5, Maximum VCs: 2048, Current VCCs: 2
Tx buffers 256, Rx buffers 256, Exception Queue: 32, Raw Queue: 32
VP Filter: 0x7B, VCIs per VPI: 1024, Max. Datagram Size:4496
PLIM Type:SONET - 155Mbps, TX clocking: INTERNAL
2 input, 18 output, 0 IN fast, 0 OUT fast
Rate-Queue 0 set to 10000Kbps, reg=0x42B PERMANENT
Rate-Queue 1 set to 8192Kbps, reg=0x5BE DYNAMIC, 2 VCCs
Config. is ACTIVE
```

- Use the **show atm traffic** command to display the interface traffic as follows:

```
Router# show atm traffic
2 Input packets
18 Output packets
9 Broadcast packets
0 Packets received on non-existent VC
0 Packets attempted to send on non-existent VC
0 OAM cells received
0 OAM cells sent
```

Using the Debug ATM Commands

The following **debug** commands are available to aid in solving ATM network problems:

- To create a dump of all protocol packets, use the **debug atm packet** command:

  This command displays the contents of the SNAP/NLPID/SMDS header followed by the first 40 bytes of a packet in hexadecimal format.

- To display errors, use the **debug atm errors** command:

  This command displays information from all detected ATM errors; including such errors as encapsulation failures and errors during ATM configuration.

- To display ATM events, use the **debug atm events** command:

  This command displays event changes to the ACIP. Reset, VC configurations, ACIP configurations, and PLIM failures are displayed.

After you use a **debug** command, turn off debugging with the **no debug** command.

Following are additional **debug** commands specifically related to the ACIP:

- To display changes in connectivity to the TeraLink system, use the **debug cable channel** command.

- To display changes in subscriber modem status, use the **debug cable modem** command.

- To display error messages that are caused by unexpected system behavior or problems connecting to the Teralink system, use the **debug cable error** command.

Examples of ATM Error Messages

Following is a list of possible error messages displayed when you enter the **debug atm event** command:

Error Message
```
RESET(ATM2/0): PLIM type is 0, Rate is 0Mbps
```

Explanation   Displays the PLIM TYPE value returned from the ACIP and the expected associated rate.

Error Message
AIP_disable(ATM2/0): state=1

Explanation   The DISABLE code to shut the ACIP down has been entered.

Error Message
config(ATM2/0)

Explanation   The current configuration to the ACIP was sent including TXBUFF, RXBUFF, exception queue length, raw queue length, and rate queue information.

Error Message
AIP_enable(ATM2/0)

Explanation   The ACIP is taken out of shutdown.

Error Message
AIP_love_note(ATM2/0): asr=0xaaaa

Explanation Received a *love note* from the ACIP. Love notes are messages that the ACIP passes to the RSP to indicate an action or event has taken place. For example, the ACIP signals the RSP with a love note when the ACIP completes a VC setup/teardown request. Another love note signals to the RSP that CD sense has changed. The *ASR* is a bit mask that defines the actions that might have taken place. The ASR values are different for all the interfaces. Of the following bit mask values, only 0x4000, which singles CD state changes, is consistent between the different interfaces:

- 0x8000—IP panic

- 0x4000—CD state change

- 0x200—Command to ACIP has completed

- 0x00n0—Completion status of a command (0... 9) 0 is OK; a value of >0 indicates failure

All other values of the ASR are meaningless and discarded. The love note messages only show up if **debug atm event** is turned on.

Error Message
AIP_cstate(ATM2/0): state=1

Explanation The state of the device is changed to either UP(1) or DOWN(0).

Error Message
AIP_setup_vc(ATM2/0): vc:1 vpi:0 vci:7

Explanation A VC SETUP request is being sent to the ACIP to establish a VC.

Error Message
AIP_setup_vc(ATM2/0): vc1 creation delayed, ACIP config. in progress

Explanation The SETUP VC request is being delayed to allow the ACIP to come up and configure itself.

Error Message
AIP_teardown_vc(ATM2/0): vc:1 vpi:0 vci:

Explanation A VC teardown is requested. The VC is being deconfigured.

Error Message
AIP_enable(ATM2/0): restarting VCs: 5

Explanation All previously configured PVCs are being reconnected on the ACIP.

Following is a list of possible error messages displayed when you enter the **debug atm errors** command:

Error Message
AIP_love_note(ATM2/0): UNKNOWN asr=0x0000

Explanation A bad love note message was passed back by the ACIP.

Error Message
AIP_setup_vc(ATM2/0): TIQ err. VC 1 peak 1000 avg. 1 rateq rate 2

Explanation Indicates that a VC SETUP failed because the average rate requested could not be configured on the ACIP. The average rate is far too low compared to the peak rate.

Error Message
AIP_setup_vc(ATM2/0): CQ err. VC 1 CQ=2048 MTU=256000

Explanation This error message indicates that the cell quota selected is out of the range allowed by the ACIP. In the case of PVCs, the parser catches these. The error message indicates SVC violations are out of range.

Error Message
AIP_setup_vc(ATM2/0): Return value 0

Explanation The return value from the ACIP after a setup request.

Error Message
AIP_teardown_vc(ATM2/0): Return value 0

Explanation The PVC teardown return code from the ACIP. 0 = Success.

Error Message
ATM(ATM2/0): Config. scaler error. RateQ 1, rate 1

Explanation Indicates that the rate specified for the peak rate is not allowable. The parser should catch most of these.

Error Message
AIP_raw_input(ATM2/0): bad OAM type 0xaaaa

Explanation The RSP received an OAM cell with an invalid OAM type value.

Error Message
AIP_raw_input(ATM2/0): bad OAM function 0xaaaa

Explanation The function value in the OAM cell is invalid in one of the following:
F4 SEGMENT
F4 END-to-END
F5 SEGMENT
F5 END-to-END

Error Message

atm_pakalign(ATM2/0): Invalid VC(65535) received, type=0xaaaa

Explanation   A packet was received by the ACIP with a VC that is out of the valid range of VCs.

Error Message

atm_pakalign(ATM2/0): VC(1) NOT configured, type=0xaaaa

Explanation   A packet was received by the ACIP for which a VC is not configured.

Error Message

ATM(ATM2/0): Encapsulation error, link=0xaaaa, host=0xaaaa

Explanation   The ATM software failed to encapsulate a protocol because the protocol/address are not in a STATIC map table.

Error Message

ATM(ATM2/0: Encapsulation error, VC=1 not connected

Explanation   A static map exists for the protocol address, but the VC has not been configured.

Error Message

ATM(ATM2/0): VC(1) Bad SAP received

Explanation   A packet with a bad SNAP encapsulation was received.

Error Message

ATM(ATM2/0): Bad VC(1) encapsulation configured

Explanation   An internal error has occurred. Check the VC encapsulation.

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- Telnet: cco.cisco.com

- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

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